B1 Determining the Amount of Municipal Solid Waste (MSW) Recycled

Use this worksheet to compile recycling data reported on the survey forms. The total amount of MSW recycled in your state or locality is the numerator of the recycling rate equation.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are calculating a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Completed Survey Forms 1 (Collectors), 2 (Processors), and 3 (End Users).

How You Will Use The Information Obtained:

- Recycling data will be used in conjunction with the waste generation data obtained in Worksheet B2 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ If you received data from more than one type of respondent (e.g., collectors and processors), use the tables in Parts 1 and 2 to:
  - ✔ Verify the data received from one source by cross-checking it with data received from another source.
  - ✔ Identify redundant data and instances of possible double counting.
- ✔ If you received data on Commingled Materials from respondents, use the procedure provided to estimate the weight of each component material.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

I. Residential Recycling Data

1A. For each recyclable material, total the data reported by each collector in the Residential column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting of data, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data (you will not use it again). For example, if you received data on residential glass recycling from both collectors and processors, circle the data that you believe is the least likely to result in double counting. Remember to circle only one survey respondent for each material. If you surveyed only one type of respondent, simply fill out the corresponding column below.

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

1B. If you received data from survey respondents on Commingled Materials for residential programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 1A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 1A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

1B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

2. Commercial Recycling Data

2A. For each recyclable material, total the data reported by each collector in the Commercial column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data. If you surveyed only one type of respondent, simply fill out the corresponding column below.

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

2B. If you received data from survey respondents on Commingled Materials for commercial programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 2A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 2A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

2B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

3. Total Recycling Data

3A. If you used the double counting exercise, in the table below enter the circled data from Parts 1 and 2 for each residential and commercial recyclable material. If you did not use the double counting exercise, simply enter below the available data from Parts 1 and 2. Then, add those numbers to arrive at the total amount recycled for each material. Finally, add the totals in the last column to arrive at the total amount of MSW recycled in your state or locality.

3A. Recyclable Material	Source of Recyclable Material		
	Residential (tons) +	Commercial (tons) =	Total (tons)
Food Waste			
Glass Containers:			
Clear			
Amber			
Green			
Mixed Glass			
Other Glass			
Subtotal Glass			
Lead-Acid Batteries			
Metals:			
Aluminum Cans			
Tin/Steel Cans			
Major Appliances			
Other Ferrous			
Other Nonferrous			
Mixed Metals			
Subtotal Metals			
Paper:			
Old Magazines			
Old Newspaper			
Old Corrugated Containers			
Office Papers			
Telephone Directories			
Mixed Paper			
Other paper			
Subtotal Paper			
Plastic:			
PETE			
HDPE			
PVC			
LDPE			

3A. Recyclable Material	Source of Recyclable Material: Residential (tons) +	Commercial (tons) =	Total (tons)
Plastic (continued)			
PP			
PS			
Mixed Plastic			
Other Plastic			
Subtotal Plastic			
Textiles			
Tires			
Wood:			
Wood Packaging			
Other Wood			
Subtotal Wood			
Yard Trimmings:			
Brush and Branches			
Grass			
Leaves			
Tree Stumps			
Mixed Yard Trimmings			
Subtotal Yard Trimmings			
Other Recyclables:			
_____			
_____			
_____			
Subtotal Other Recyclables			
TOTAL (tons)			_____ **This is the numerator of the recycling rate equation (for Worksheet B3).**

B2 Determining Waste Generation

Use this worksheet to determine total municipal solid waste (MSW) generation for your state or locality. Waste generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons. It is the denominator of the recycling rate equation.

This worksheet can be used for compiling waste disposal data reported on the standard survey forms (Parts 1 and 2), or for estimating waste generation if actual disposal data are not available or reliable (Part 3).

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.
- State and local governments using Worksheet A to convert to the standard recycling rate (Part 3 only).

What You Will Need:

- Completed Survey Forms 4 (Collectors), 5 (Transfer Stations), and 6 (Disposal Facilities).
- Population data for the current measurement year (Parts 2 and 3 only).
- Your state or local waste characterization study, if available (Part 3 only).

How You Will Use The Information Obtained:

- The waste generation figure calculated in this worksheet will be used in conjunction with the recycling data obtained in Worksheet B1 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ This worksheet contains three sections. Read the description of each to determine which are applicable to your particular situation. In most cases, only one or two of the sections will be need to be completed.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

Determining Waste Generation

I. Compiling Waste Disposal Data

Complete this section if you have current survey data on waste disposal.

1A. In-State Disposal

For each type of survey respondent (i.e., collectors, transfer stations, disposal facilities), total the amount of residential MSW from sources within your state or locality that remained within your area (e.g., not hauled to a transfer station or disposal facility outside your state or locality). This data can be found on Forms 4, 5, and 6, Part 2A, first column. If you used more than one type of survey form to collect data, be sure to not double count any data, i.e., MSW sent by a surveyed transfer station to a surveyed disposal facility. If you used only one type of survey form (e.g., Survey Form 5, Transfer Stations), simply fill out the corresponding column below.

Repeat the above procedure for commercial MSW.

MSW REMAINING INSIDE THE STATE OR LOCALITY	Survey Respondent			TOTAL (tons)
	Collectors	Transfer Stations	Disposal Facilities	
Residential (tons)				
Commercial (tons)				

1B. Exports

For each type of survey respondent, total the amount of residential MSW from sources within your state or locality that was exported from your area (e.g., hauled by a collector or transfer station to a disposal facility outside your state or locality). This data can be found on Forms 4 and 5, Part 2A, second column. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed transfer station.

Repeat the above procedure for commercial MSW.

MSW EXPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1C. Imports

For each type of survey respondent, total the amount of residential MSW from sources outside your state or locality that was imported into the area (e.g., hauled by a collector to a transfer station or disposal facility inside your state or locality). This data can be found on Forms 4, 5 and 6, Part 2B. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed disposal facility.

Repeat the above procedure for commercial MSW.

MSW IMPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1D. Total Residential MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Residential MSW Disposed Of (tons)**

1E. Total Commercial MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Commercial MSW Disposed Of (tons)**

1F. Total MSW Disposed Of

_____ + _____ = _____

Total Residential MSW *(from 1D)* | Total Commercial MSW *(from 1E)* | **Total MSW Disposed Of (tons)**

1G. Total MSW Generated

_____ + _____ = _____

Total MSW Disposed Of *(from 1F)* | Total MSW Recycled *(from Worksheet B1, Part 3)* | **Total MSW Generated (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

2. Extrapolating Waste Generation Data (optional)

Complete this section if you received less than a 100 percent response rate to your survey. In this section you will use the partial data received to extrapolate total MSW generation. In other words, it will allow you to calculate a total even though you have data from only a portion of your state or locality.

2A. Estimate the population represented by the data received in your latest survey:

_____
Estimated Population

2B. Complete Part 1 using the data received in your latest survey.

2C. Per Capita Waste Generation:

_____	÷	_____	=	_____
Total MSW Generated *(from 1G)*		Estimated Population *(from 2A)*		**Per Capita Waste Generation**

2D. Extrapolated MSW Generation:

_____	x	_____	=	_____
Per Capita Waste Generation *(from 2C)*		Current Measurement Year Total Population		**Extrapolated MSW Generation (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

3. Using Waste Characterization Data to Determine Waste Generation

Complete this section if you do not have the resources or authority to conduct annual surveys, or if you are not confident in the data generated by your latest survey. This section will allow you to estimate the total amount of MSW generated in your state or locality using either national default data or a waste characterization study, if available.

3A. If you have a state or local waste characterization study, use Worksheet A to determine if the scope of waste in your study is consistent with the scope of MSW used here. If inconsistencies exist, proceed to Part B to estimate MSW generation. Alternatively, you may complete Worksheet A to arrive at a recycling rate that has the same scope as the standard recycling rate. If inconsistencies do not exist, then calculate estimated waste generation using the following method:

1) **Per Capita Waste Generation:**

Total Annual MSW Generated *(from study)*	÷	Total Population *(year of study)*	=	**Per Capita Waste Generation**
_____		_____		_____

2) **Estimated Waste Generation:**

Per Capita Waste Generation	x	Current Measurement Year Total Population	=	**Estimated MSW Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____		_____		_____

3B. If you do not have a waste characterization study, or your study does not define MSW in the same way as the standard definition used here, calculate estimated waste generation using the following equation:

1) **Estimated Waste Generation:**

Current Measurement Year Total Population	x	**0.78 tons/person/year***	=	**Estimated Waste Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____				_____

*U.S. EPA. 1997. Characterization Study of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC.

WORKSHEET

B3 Calculating Your Municipal Solid Waste (MSW) Recycling Rate

Use this worksheet to determine your state or locality's MSW recycling rate for the current measurement year.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are establishing a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Total MSW recycled from Worksheet B1.
- Total MSW generated from Worksheet B2.

I. Calculating Your Municipal Solid Waste Recycling Rate

Calculate your state or local MSW recycling rate according to the following equation:

Total MSW Recycled *(from Worksheet B1, Part 3)*	÷	Total MSW Generated *(from Worksheet B2, Part 1G, 2D, 3A, or 3B)*	x 100 =	**Municipal Solid Waste Recycling Rate (%)**
_____		_____		_____